

It might be suggested as an improvement to future travellers, that in the arrangement of the plates more attention should be paid to varieties, and that the several forms should be placed side by side according to their affinities. There is no point of so great interest to the scientific student of early culture as the allied varieties of form. As a rule with exceptions, it may be said that arts which are indigenous present greater varieties than those which are exotic, and hence the importance of studying minute differences, more especially in cases where, by means of gradual variation, transitions to other types or other uses may be traced. A few finished drawings are no doubt valuable in order to give a correct idea of the leading types; but for the varieties, outline drawings on a smaller scale in the style of the illustrations of "Demmin's History of Arms," are all that is needed, and enable these transitions to be given at a trifling cost. With these additions, and with due attention to such other matters relating to savage art as are suggested in the "Anthropological Notes and Queries," published by the British Asso-

ciation, we would earnestly commend the example of Dr. Schweinfurth to all travellers, for, as he truly says in his preface, "Hurry is needed: the destructive tendency of our industrial productions obtruding themselves upon all the nations of the earth menaces, sooner or later, to sweep away, even in Africa, the last remnants of indigenous arts." Of the utility of such a work as this no anthropologist or antiquary can doubt. There is, however, one remark of the author's to which we would draw special attention, and which he in this work reiterates with commendable emphasis:—"A people, as long as they are on the lowest step of their development, are far better characterised by their industrial products than they are either by their habits, which may be purely local, or by their own representations, which, rendered in their rude and unformed language, are often incorrectly interpreted by ourselves. If we possessed more of these tokens we should be in a position to comprehend better than we do the primitive condition of many a nation that has now reached a high degree of culture."

RECENT FRENCH EXPERIMENTAL PHYSIOLOGY

Physiologie Experimentale. Travaux du Laboratoire de M. Marey. (Paris: G. Masson, 1876.)

UNDER the auspices of the Minister of Public Instruction of France are published from time to time volumes of the "Bibliothèque des Hautes Études." The

work before us is one of these, and its value will be fully appreciated by any physiologist or physicist who has once glanced at its well illustrated pages. It contains several papers by M. Marey, mostly on points connected with the employment of the "graphic" method of depicting the magnitude and duration of dynamical phenomena both physical and physiological, and two by Dr. François-

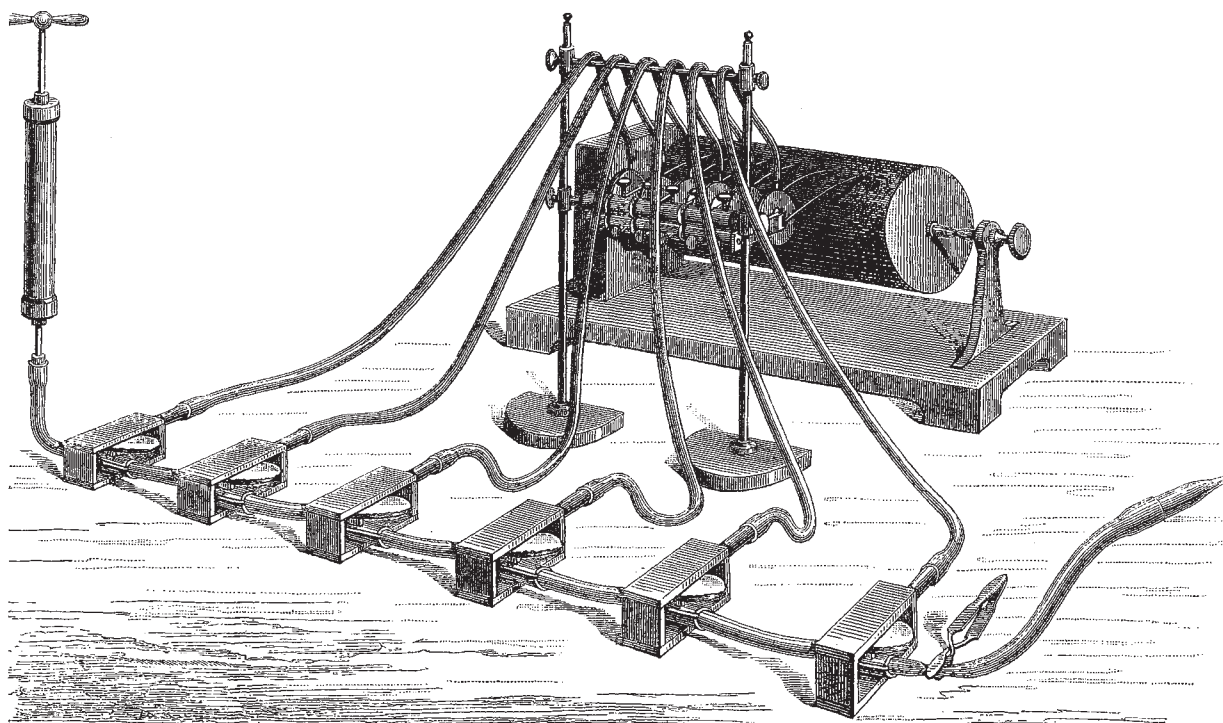


FIG. 1.

Franck on the anatomy and physiology of the vascular nerves of the head.

The most important of the memoirs by M. Marey is, in our estimation, that on "the movements of liquid waves, undertaken with a view of assisting in the theory of the

pulse." Of this we will give a short account on the present occasion.

M. Marey's extraordinary mechanical skill has enabled him to devise and construct an apparatus by means of which he has been enabled to represent synchronously,

by the graphic method, the moment of origin and the conformation of the wave produced in every part of an india-rubber tube distended with fluid. A glance at the accompanying figure (Fig. 1.) will indicate the method employed. The wave is produced by the movement of the piston of the pump at the left side of the figure. It is transmitted along the continuous horizontal tube in the foreground, which is made to record the movements of six equidistant spots twenty centimetres apart, on the revolving drum, covered with smoked paper, in the background, by means of the delicate system of double "tambours," or elastic-covered drums and levers which have been introduced and so much employed by the author. The tubes connecting the tambours, being of the same material and of equal length, any error from irregularity in the rate of transmission along them is avoided. A pair of forceps, as in the figure, close the experimental tube just beyond the point of attachment of the last of the tambours.

When a positive wave, in other words, one of compression, is transmitted along this tube, thus arranged, it is seen that the levers rise one after the other, beginning at that nearest the piston; and that immediately the last one begins to rise, a second wave commences in the opposite direction. There is still more to be learnt from the curves recorded on the smoked cylinder, which are reproduced in Fig. 2, from an actual experiment. In this figure the six undulations are those of the six levers, the lowest being that of the portion of the tube nearest the piston, and the highest that of the furthest end. The trace of a chronograph vibrating fifty times a second is given below the lowest of the curves. Perpendiculars projected from the summits of each of the curves upon the chronograph trace would be separated by equal intervals if, during the different parts of its course, the rapidity of transmission of the wave were uniform. But it is seen from the figure under consideration that, although in traversing each 20 centimetres of the tube the wave takes about one-fiftieth of a second, and so travels at the rate of about 10 metres a second, nevertheless its rapidity is not absolutely uniform, being at its maximum at its orifice of entry, and after it has become slower again, slightly increasing in velocity in the neighbourhood of the closed end. There is therefore a double change in the velocity of the wave.

When it has reached the extremity of the tube the wave takes a reverse course, and returns through each of the recording drums to the place from which it started. This reflected wave is indicated by the down-turned arrows in Fig. 2; the direct one and its secondary companions having

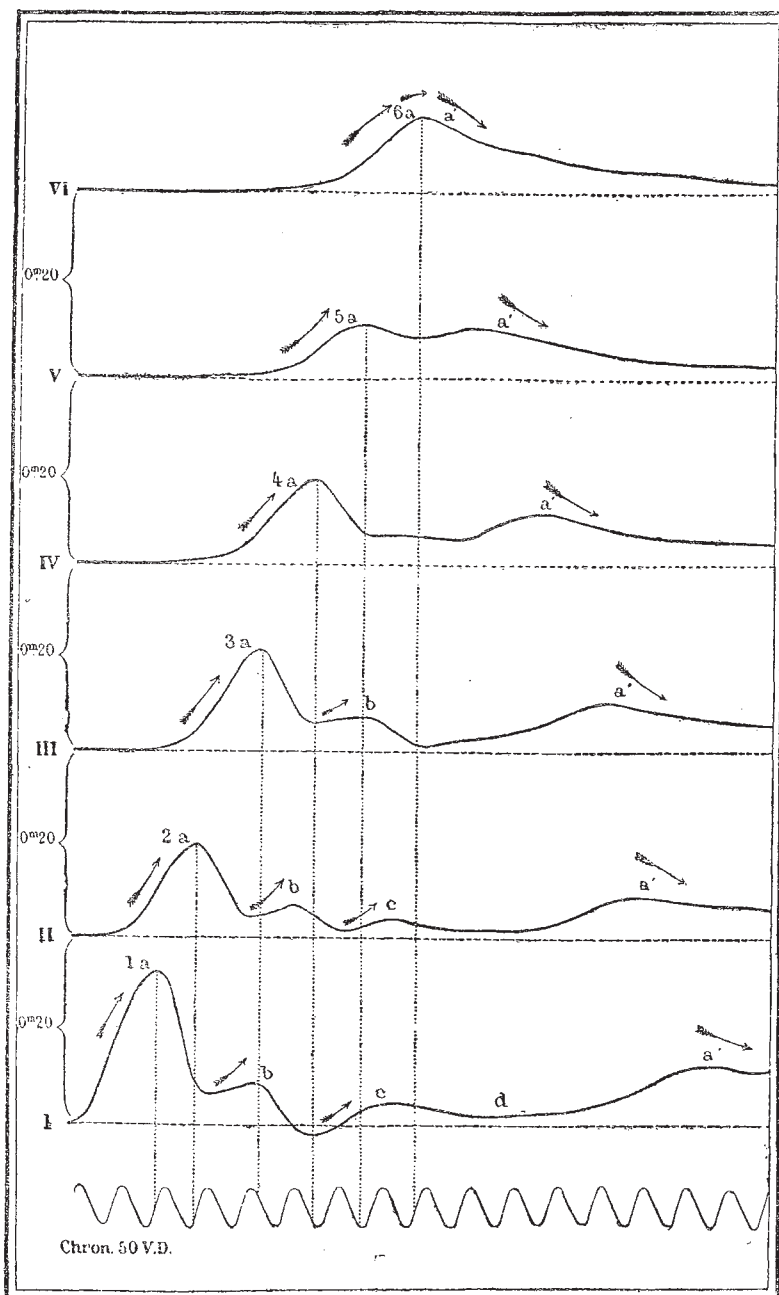


FIG. 2

upturned arrows above them. By varying the distance of the occluding forceps from the last recording tambour the time of commencement of the reflected wave can be similarly varied.

It is interesting to observe that in a paper on the movement of the pulse-wave in the human arte-

ries,* Mr. Garrod has shown that the pulse-wave augments its rapidity as it gets further from the heart, a result which is specially interesting in connection with those of M. Marey on the undulations in closed tubes, the blood system being similar in all respects.

With reference to the changes of the height of the undu-

augmentation in its rapidity. This depends on the elasticity of the tube, which tends to distribute the pressure in the different parts of the liquid column.

It will be seen from Fig. 2 that the primary direct wave is followed by a more or less numerous series of secondary diminishing minor waves. They are dependent on the rapidity with which the liquid is forced into the elastic tube. The reflected wave may also give rise to secondary undulations. The whole of the foregoing results are represented in a most vivid manner by the translation of their results stereoscopically or into a figure of three dimensions, represented in Fig. 3. We have never before seen results of a similar kind similarly depicted.

Among the other results arrived at by the employment of the same instrument, M. Marey has shown that *negative waves*, that is of absorption, obey exactly the same laws as do *positive waves*, or those of compression; also, in tubes opened at their distant end, if the aperture is large, no reflected wave is produced, at the same time that the intensity of the undulation diminishes from one to the other end, and its rapidity also gradually.

(To be continued.)

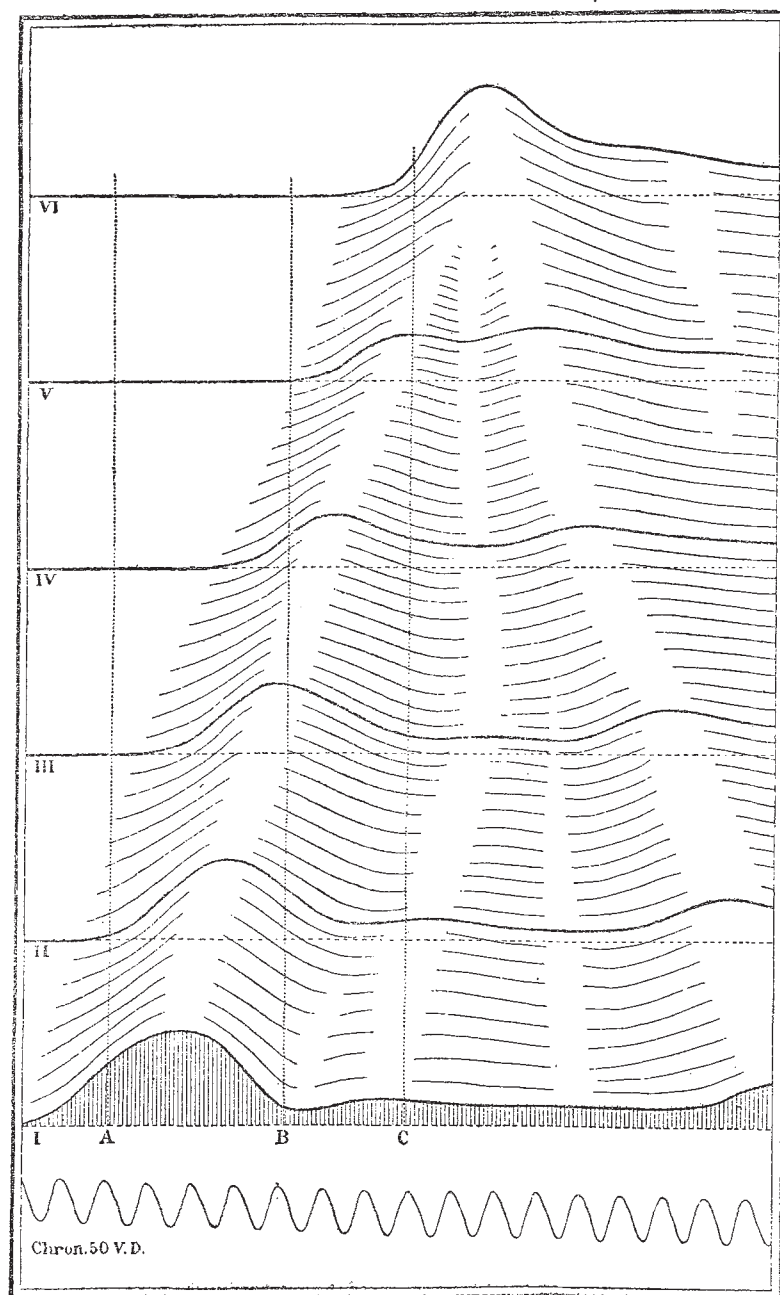


FIG. 3.

lation in different parts of its course, it can be proved that the wave has its maxima of intensity at its two ends, its minima in the intermediate part of its course. The wave also changes in form during its progress, this change consisting essentially in a diminution in its amplitude and an

valuable information conveyed, information in itself calculated to interest in a high degree any healthy mind, and which the compiler has had skill enough to put into shape without detracting from its interest.

While we congratulate the publishers on their successful attempt to elevate the quality of drawing-room litera-

* "Proc. Royal Soc.," 1875, p. 150.

THE ARCTIC WORLD
The Arctic World: its Plants, Animals, and Natural Phenomena.
(London and Edinburgh: Nelson and Sons, 1876.)

THE Messrs. Nelson have in the present work made a praiseworthy attempt at innovation on the usual style of drawing-room book; for that "The Arctic World" is meant mainly for the drawing-room table its whole appearance indicates. The work is something more than a mere picture-book, though its pictures are certainly a striking attraction. The compiler of the text has made an honest, and, we believe, remarkably successful, attempt to carry out the promise of the title-page, and present a satisfactory account of the physical phenomena, the plants, animals, people, and scenery of the entire round of the Arctic regions. There is really a great amount of solid and accurate and